On the Scientific Exploration of the Caspian Sea.

By M. Oscar Grimm.

During the past year (1874) I have been able to investigate the southern portion of the Caspian. I resided two months at Bakou, and passed one month on board a steam-schooner which was placed at my command by the Grand-Duke Michael Nicholajewitsch. I then went from Bakou to Krassnowadsk, and from the latter point to the eastern shore in the Balchanic gulf, in which the mouth of the Oxus was formerly situated, by the island of Tscheleken. Afterwards I went south to Astrabad, thence to Enzili, to Lenkoran, and again to Bakou.

Everywhere I fished and dredged down to a depth of 150 fathoms, which enabled me to procure a very considerable number of animals, among which are six new species of fishes (a *Gobius* and 5 *Benthophili*), twenty species of Mollusca (*Rissoa dimidiata*, *Hydrobia caspia*, *H. spica*, *H. stagnalis* with two varieties, *Eulima conus*, *Neritina liturata*, *Lithoglyphus caspius*, *Bythinia Eichwaldi*, *Planorbis Eichwaldi*, sp. n., *Cardium edule* and var. *rusticum*, *C. caspium*, *C. crassum*, *C. trigonoides*, *Adacna vitrea*, *A. edentula*, *A. plicata*, *A. læviuscula*, *Dreissena polymorpha*, *D. caspia*, *D. rostriformis*, and some other terrestrial and fluviatile Mollusca), a Bryozoan (*Bowerbankia densa*, Farre, in which the colonial nervous system may be admirably seen), and about thirty-five species of Crustacea, among which we find the family Gammaridæ in particular represented by colossal forms and *Idothea entomon* in considerable quantities. Then there are twenty species of worms (*Sabellides octocirrata*), numerous Turbellaria, two sponges (*Reniera flava*, sp. n., or perhaps a variety of *R. alba*, O. Schm., and another *Reniera* in the larval state), and, lastly, thirteen Protozoa, among which are six new species.

The most interesting gatherings were made at a depth of 108 fathoms, a level at which an enormous quantity of Crustacea and Mollusca live. At least this is the case on the western shore, while on the eastern, where the Arabo-Caspian steppe is continued beneath the sea, there is scarcely any animal life in the sand. The same poverty also occurs in the bays of Astrabad and Enzili. The western shore, on the contrary, with its high mountains and abundance of animal life, is reflected, so to speak, in the waters, where we find a depth of 517 fathoms with a comparatively rich fauna. To prove this assertion I need only cite one fact—namely, that in one haul of the dredge made at a depth of 108 fathoms, at 0° 12′ west of Bakou, in 39° 41′ N. lat., I obtained about 350 specimens of Gammaridæ belonging to four or five species, 150 specimens of *Idothea entomon*, 50 *Mysides* of colossal dimensions, 6 species of fish (determined by Kessler as *Gobius bathybius*, *Benthophilus leptocephalus*, *Grimmi*, *armatus*, *granulatus*, and *ctenolepidus*, quite new species), and, lastly, a multitude of large specimens of *Hydrobia caspia*, *Dreissena rostriformis*, &c. It must be added that this did not constitute more than about a fifth part of the animals brought up by the dredge.

I have been able to study in the Caspian 120 species of animals,

of which about 80 have been found for the first time by me. The total number of animals of the Caspian at present known must be more than 150. If this fauna is poor in comparison with those of other seas, such as the Mediterranean and even the Black Sea, my researches prove that it is much richer than it has hitherto appeared; and the assertion of Von Baer, that "whoever chooses to be led away by his *mihiismus* to establish new species must elevate slight varieties to the rank of species," unfortunately* appears not to be justified. This is especially evident if we consider that this sea has even now been but little examined, particularly in its deepest parts, where animal life seems to be manifested most intensely. The water of the Caspian being poor in saline constituents, it is in the deep parts that its composition most nearly approaches that of sea-water.

I intend giving you only the most general results of my researches as they appear at present before the study of the animals collected has been terminated, and even, I may say, at the moment when I am commencing it.

In its fauna the Caspian presents the characters of a great half-salt lake which possesses its own peculiar species of animals, and also contains others which occur in other seas. The former (*e. g.* the new *Gobius* and *Benthophili*) originate from living or already extinct species, or they result from slight modifications of allied species living in other seas, as is the case with *Coregonus leucichthys*, *Calictis caspia*, Eichw. (which is a good species), *Petromyzon Wagneri*, Kessl., *Tintinnus mitra*, sp. n., and *Reniera flava*, sp. n. The other animals (that is to say, those which occur also in other seas) possess a great tenacity of life, since they still prosper where their less robust ancient colleagues have long since died out: in this category we place *Rotalia veneta*, *Sabellides octocirrata*, *Laguncula repens*, *Mysis relicta*, and *Idothea entomon*.

These species common to different seas show the affinities of the Caspian Sea to the Aral Lake, the Black Sea, and the Arctic Ocean; but the affinities with the glacial sea seem to be more recent than those with the Black Sea; for in the latter certain species, such as the seals, *Coregonus leucichthys*, and others which are common to the Caspian and glacial seas, are wanting. We may suppose that in the Tertiary epoch there existed in Europe and in the neighbouring parts of Asia a vast closed basin of fresh water. By an upheaval of the crust of the earth, due to the action of the volcanic forces which still make themselves felt energetically in the region of the Caspian, this was separated into some smaller basins, which are the existing Black Sea and the Aralo-Caspian basin. The latter in its turn was afterwards divided into two, just as we still see small salt lakes separate from the Caspian. At the same time the water of the glacial sea penetrated into the basin of the Caspian, which still had a slight connexion with the Black Sea, so that only a small number of animals could arrive there from the glacial sea. Hence we find

* I say "unfortunately," because I do not like new species, and yet find myself compelled to establish a considerable number.

that the primitive forms of the Caspian are freshwater animals (*e. g. Dreissena polymorpha*), and then that the emigrants from the glacial sea which reached it are marine animals for the most part inhabiting great depths. Hence, also, we recognize that the Caspian in its fauna presents more affinities with the glacial than with the Black Sea, which, again, has become richer in animals under the influence of the Mediterranean.

The Caspian has not only received species from the glacial sea, but has also furnished it with some—as, for example, a species of sturgeon, which seems to be *Acipenser ruthenus*, and lives in the rivers of Siberia. I regard the Sturgeons as belonging to the ancient Aralo-Caspian basin, and as having emigrated, as has been said, into the glacial sea, and perhaps even to America, where, as is well known, the nearest relatives of the *Scaphirhynchi* of the Aral exist. On the other hand we may presume that the place of origin of the Acipenseridæ was the Indian Ocean, and that they were derived from the Selachia, with which, especially when young, they have many points in common (*e. g.* their teeth).

I shall only add a few remarks. The Oxus of the ancients unquestionably fell formerly into the Caspian Sea. In this sea the abundance of animal species is replaced by an abundance of individuals; and the greater number of the species of Mollusca described by Eichwald as subfossil have been found by me in the living state, and are represented by individuals as large as their fossil relatives. Lastly, the deepest parts of the sea have been found to be most abundantly populated with species of animals quite different from those which inhabit the regions having only a depth of a few fathoms.—*Zeitschr. für wiss. Zool.* vol. xxv. p. 322, 1875; *Bibl. Univ., Bull. Sci.* December 15, 1875, p. 427.

On Fossil Remains of Reptilia and Fishes from Illinois.

By E. D. Cope.

John Collett, the accomplished assistant of Prof. Cox of the Geological Survey of Indiana, recently submitted to my examination a number of vertebrate remains from some point in Illinois. The specimens were taken from a blackish shale, and consist of separate vertebræ and other elements of the skeleton, often in a fragmentary condition. Although the absence of information as to the mutual relations of the pieces renders the identification difficult, yet the interest attaching to them, in consequence of their peculiar forms and the locality of their discovery, renders it important to determine their zoological position. Mr. Collett informs me that all the specimens were found near together, and at the same horizon, by Dr. Winslow. Much credit is due to Dr. Winslow for the painstaking labour bestowed in procuring and cleaning the specimens, and for his liberality in presenting them to the geological collection.

A remarkable peculiarity of all the vertebræ of the series is the longitudinal axial perforation of the centrum. They present the character observed in *Archegosaurus* and other stegocephalous Batra-